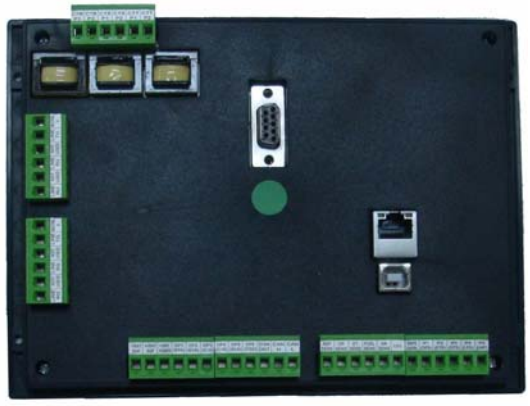
S. & A.S. LTD

AUTOMATIC MAINS FAILURE – SURF-AMF

AUTO START – SURF-AUTO

ENHANCED



USER'S MANUAL

FOR H/W VERSION 1.2A
FOR S/W VERSION 2.00
1516

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1 INTRODUCTION

This new genset controller series consists of two products: Surf-AMF and Surf-Auto. The Surf-AMF monitors the utility and controls the genset as well as the automatic transfer switch. The Surf-AUTO controls the genset only. However, the two controllers share many common features. Physically, the Surf has a very attractive and slim design. It features isolated measurement of the voltages and frequency on the two sources as well as the current on the load side. It has four user-selectable operating modes: Off, Auto, Utility Only[1] or Manual. Front panel LEDs signal the installation status and operating mode. The user interface consists of an LCD display for the measurements and faults. The front panel push buttons are provided to select the operating mode and to access a menu of parameters. The menu gives access to all timers, set points and other parameters relevant to the control and protection of the installation. The Surf series has a myriad of communication ports: CAN bus, Serial RS232C, USB, Ethernet and internet. The firmware could be easily upgraded on site via the USB interface.

2 FEATURES

- Microcontroller based design
- Automatic mains failure or Auto Start controller
- Backlit liquid crystal display (LCD)
- Simultaneous display of AC voltage, currents, frequency, hour counter, oil pressure, engine temperature and battery voltage
- Display of power in KW and energy in KWh
- Display of fuel consumption rate (L/h), total fuel consumption and RPM (available only if CAN bus is supported by the engine)
- CAN bus J1939 enabled
- Ethernet interface
- USB interface
- Serial RS232S interface
- Internet communication: no software installation required
- Galvanic isolation for utility and genset AC inputs
- Parameters can be edited and updated from any remote interface at any time even when engine is running
- Menu accessible from front panel as well as USB, Ethernet and Serial
- Supports communication and SMS via GSM modem
- Supports 4-pole systems (Utility and Genset AC inputs are isolated)
- Operation by push buttons
- Easy to fit DIN standard 196x144 panel mount housing
- Connection is via locking plug and socket connectors
- Solid-state short circuit protected outputs
- Front panel LEDs for inputs status
- LCD symbols to display different alarms
- Automatic engine starting and stopping
- Automatic shutdown on fault condition
- Low oil pressure alarm and shut down
- High engine temperature alarm and shut down
- Dynamo fail alarm and shut down
- Low fuel alarm and shut down
- Over / Under speed alarm and shut down
- Low coolant level alarm and shut down
- Over / Under voltage alarm and shut down
- Overcurrent alarm and shut down
- Configurable I/Os

3 OPERATION

Four modes of operation are provided. Following is a description of each mode:

- **Off Mode:** This mode is entered when the Off push button is pressed for more than 3 seconds. In this mode, the engine and the module are shut down. All faults and alarms are reset.

[1] Only Available for Surf-AMF

- **Manual Mode:** This mode is entered when the Manual/Down push button is pressed. In this mode, the module will start the genset and engage the load. If, originally, Utility was feeding the load and the genset has no fault, Utility will continue feeding the load until the genset is done warming up[(2)]. The load is disengaged and a transfer dead time[(3)] is counted before the genset engages the load. If the genset has a fault, then Utility would disengage the load immediately.
- **Utility Only/Standby Mode:** This mode is entered when the Utility/Select push button is pressed. In this mode, if Surf type is Surf-AMF, the Utility would feed the load when it is present. If Utility is absent or Surf type is Surf-AUTO, the genset will not be requested. If the genset was feeding the load before switching to this mode, the load will be disengaged.
- **Auto Mode:** This mode is entered when the Auto/Up push button is pressed. In this mode, Utility will feed the load if present. If Utility is absent, the genset will feed the load if no faults exist on it and if the remote control signal is active. If the genset was feeding the load and the remote control signal turns off, the genset would count the delay set by **oFF** (for Surf-AUTO) – **MRT** (for Surf-AMF) before disengaging the load. If the Utility is restored while the genset is feeding the load, Genset disengages the load after Restoration delay. Utility will engage after transfer dead time.

Following is a description of the start sequence of the genset:

1. Once the remote control input receives a start signal, the response delay (set by **RSP**) is counted.
2. After the elapse of the response delay, the preheat relay (if present) is engaged for a time delay set by **PRH.**
3. A starting sequence of a preset number of attempts **ATT** will initiate.
4. The Electric Valve is engaged for 0.25 sec before the Starter.
5. If the start signal is removed before the engine starts, all timers are reset and the module is ready for a new sequence.
6. Cranking is disconnected when any of the following condition becomes valid:
   a. The measured frequency exceeds **CrF**.
   b. A voltage exceeding **dcd** (if not set to **N**) appears on the **Dynamo** input.
   c. The oil pressure switch opens (given that **boP** is not set to **Y**) and its preset delay has elapsed.
   d. The analog oil pressure measurement exceeded the value set by **LoA** (if not set to **N**).
   e. For Volvo engines, when a running indication is received through the CAN bus or the RPM exceeds 500.
7. If the engine fails to start after the preset number of attempts, the **Alarm** output is activated, the LCD alarm symbol (**!**) blinks and the Multifunction Display on the LCD would indicate a start fail error (**St Fail**). Otherwise, the engine enters the running state and the running symbol ( ) turns on.
8. After elapse of the warm-up delay, set by **WuP**, the load contactor is engaged via terminal **Contactor-G** and the green load led is activated. If one of the Outputs is set to Cont-G2, then Cont-G2 would be engaged 5 seconds after the first Contactor.
9. All protections are enabled when the engine is running and after the elapse of the fault bypass time set by **bYP**.
10. Once a fault occurs, the load is shut down. Some faults require the engine to cool before shutting (high engine temperature, overload). Other faults would directly shut the engine. **Alarm** output and the corresponding fault symbol on the LCD are activated. The Multifunction Display would explain the fault. If CAN bus is enabled, the Multifunction display will show the DTC (J1939 protocol error code) description of the fault received from the CAN bus.
11. When the start signal on the genset is removed, the load is shut down after the elapse of the delay set by **oFF** (for Surf-AUTO) – **MRT** (for Surf-AMF). The engine is shut down after the elapse of the cooling time set by **CoL**.

4 PROGRAMMABLE OUTPUTS

SURF has a total of six outputs (Output 1 → 6) that could be programmed to any of these functions: Preheat, Starter, Electric Valve, Utility Contactor, Genset Contactor, Alarm, Cut-off, Pre-alarm, Genset Contactor 2, Dummy Load, Overload, Start Fail and Auto Mode. Users can easily change the function of these outputs from the menu, parameters **O1** → **O6**. The user can also disable the output by setting the corresponding parameter to Not Assigned (**N/A**). Following is a description of each function:

- **Preheat** (**PRE**) **Function** when one of the outputs is set to Preheat, the **PRH** parameter in the menu becomes visible and takes the default value 0. The preheat output is activated when the genset finishes counting the response delay and remains on for a delay set by **PRH**.

[2] Warm Up delay is presettable in the menu
[3] Transfer dead time is presettable in the menu

- **Starter** (**STA**) **Function** is activated while cranking the genset and remains on for a delay set by **STA**. The minimum value of **STA** is 1 sec if the oil pressure is bypassed otherwise the minimum value is the oil pressure bypass delay plus one second (**boP**+1).
- **Electric Valve** (**EVA**) **Function** if present should be defined at Output 2 since the dynamo excitation is physically connected to this output. To configure the Electric Valve at another output, the dynamo input should be connected to VBAT or the dynamo shutdown must be disabled (**dSd** set to **N**) if dynamo excitation is not required. Otherwise, the dynamo input should be externally excited.
- **Utility Contactor** (**C-U**) **Function** if present should be defined at Output 3. This output is activated when Utility engages the load and turns off when the load is released.
- **Genset Contactor** (**C-G**) **Function** if present should be defined at Output 4. This output is activated when the genset engages the load and turns off when the load is released.
- **Alarm** (**ALA**) **Function** is activated when a genset fault occurs. This output is not activated on emergency stop since it disables all outputs.
- **Cut-Off** (**Cut**) **Function** is activated when the genset should be shut down and it has finished cooling, when a fault that does not require cooling has occurred and the load was released or when the SURF module is turned off while the genset was on. When the cut-off output is activated, it will remain on until the delay set by **Cut** has elapsed. If the SURF module was turned off, the module can not be turned on until the cut-off delay has elapsed. The parameter **Cut** is not visible in the menu unless this output is activated.
- **Pre-alarm** (**PRA**) **Function** is activated on a pre-alarm condition caused by the analog measurements oil pressure/engine temperature dropping below/exceeding the pre-alarm level set in the parameters' menu **LoP/HTP**.
- **Genset Contactor 2** (**CG2**) **Function** is activated five seconds after the first genset contactor is engaged if the voltage and frequency readings are correct and there is no overload condition. If an overload occurs, this contactor is disengaged first and the load is measured again, if the overload condition persists then the contactor G is disengaged. Otherwise, Contactor G remains engaged. Contactor G2 re-engages when the load decreases.
- **Dummy Load** (**dLd**) **Function** is activated when the load remains below the level specified by **doN** for a delay set by **dod**. This output is disengaged when the load current exceeds the level specified by **doF**. Parameters **doN**, **dod** and **doF** are not visible unless this output is activated.
- **Overload** (**oLd**) **Function** is activated when the load exceeds the value set by **oLd** and the module is counting the overload delay set by **oLdd** or if an overload fault occurs. The output will be turned off if the load falls below oLd before the delay elapses.
- **Start Fail** (**STF**) **Function** is activated when the genset fails to start. This output is turned off when the start fail error is no longer present. The fault is removed when the Remote Control input is recycled or when Utility is restored.
- **Auto Mode** (**AUT**) **Function** is activated when the mode of operation is Auto. This output is turned off when the mode of operation is changed from Auto.

5 PROGRAMMABLE INPUTS

SURF has a total of five digital inputs (Input 1 → 5) that could be programmed to any of these functions: Oil Pressure Switch (**oPS**), Engine Temperature Switch (**ETS**), Oil Temperature Switch (**oTS**), Low Fuel Level Normally Open (**LFo**), Low Fuel Level Normally Closed (**LFc**) and Lamp Test (**LMP**). Users can easily change the function of these inputs from the menu, parameters **I1** → **I5**. The user can also disable the input by setting the corresponding parameter to Not Assigned (**N/A**).

6 COMMUNICATION PROTOCOLS

SURF supports communication with the electronic control unit (ECU) on the genset using the J1939 CAN Bus protocol. Three different ECU types are supported: Standard Engine (**SE**), Volvo Engine (**VE**) and Perkins Engine (**PE**). Parameter **ECU** in the menu is used to select the ECU type. If the genset does not contain an ECU, set this parameter to **No**. The SURF module reads the following parameters from the CAN bus: oil pressure (PSI), engine coolant temperature (^{o}C), fuel consumption (Liters/hour), engine speed (RPM), engine total hours of operation (Hr) and the engine total fuel consumption (L).

Users can communicate with the SURF module by connecting it to a PC through an RS232 Serial Port, USB Port, Ethernet Port or a GSM Modem. When connecting from a PC, the program **SURF Control** allows the users to view and control the engine and to access the SURF parameters. When the parameter **Mod** is set to **GSM**, the user can also communicate with the SURF via SMS messages. To set up this feature, the following parameters must be set:

1. The identification of the SURF module (**SITEId**): This ID will be included as a header of all sent or received SMS messages. It must contain 6 digits which can be numbers (from 0 to 9) or letters (A to Z). Any message with a wrong ID will be ignored.
2. The phone number (**PHONE**): When a fault occurs, The SURF will send an SMS containing as a header the SURF ID followed by the fault description and all the readings at the time the fault occurred. This SMS is sent to the phone number specified by the user. The phone number must be between 3 and 18 digits long.

Following is a description of the functions supported via SMS:

Command Description	**SMS Format** [4]
Reset	SURF ###### reset[5]
Delete Fault Log	SURF ###### dltfault
Switch to manual mode	SURF ###### manual
Switch to Auto mode	SURF ###### auto
Switch to Utility mode (AMF only)	SURF ###### utility
Switch to Standby mode (Auto only)	SURF ###### standby
View utility readings (AMF only)	SURF ###### umeasure
View generator readings	SURF ###### gmeasure
Modify the parameters[6]	SURF ###### update parameter1=value1,parameter2=value2 [7] **Example:** SURF SURF00 update A01=5,A03=32,A12=145,A31=0
View the parameters[8]	SURF ###### request parameter1,parameter2,parameter3 **Example:** SURF SURF00 request A01,A03,A12,A31,A10

When modifying or viewing parameters through SMS, the SMS alias (refer to section 7) is used to identify the parameter being updated/requested. Thus, if the user wants to request the parameters **RSP**, **Mod** and **ECU** from the SURF having **SiteID** SURF00, the SMS would then be: "*SURF SURF00 request a01,a66,a64*". Note that the **parameters A64 to A76, A81 and A82 can be requested but cannot be modified through SMS.**

To set up the Ethernet module, the following parameters must be set:

1. The DHCP Module (**dHC**): If the network to which the SURF is being connected distributes IP addresses automatically, then the DHCP Module on the SURF must be enabled (**dHC** set to **Y**). If a fixed IP should be assigned to the SURF, then **dHC** should be set to **N**.
2. Network Configuration (**IP Adr**, **SubNET**, **GATEWY**): If **dHC** is set to N, the user must specify to the SURF: the IP Address (**IP Adr**), the Subnet Mask (**SubNET**) and the Default Gateway (**GATEWY**).
3. The identification of the SURF module (**SITEId**): the **SITEId** is used by the Ethernet module as a Net BIOS Name (NBNS).

7 FAULT LOG

SURF has a Fault Log that can save the last 10 faults that occurred on the genset. The Fault Log saves the type of error that occurred along with the voltages, frequency, currents, oil pressure, engine temperature, battery voltage, hour meter, KW and KWHr. The Fault Log can be accessed and erased through the SURF menu or remotely through the different communication protocols supported.

7.1 VIEWING THE FAULT LOG

To access the Fault Log, enter the menu (refer to section 7), scroll down until "**VIEWFT**" is displayed and press the SELECT push button. If no faults are saved, a "**NO FLT**" message is displayed. Otherwise, "**FLT 1**" is displayed. To scroll between the different saved faults, use the UP/DOWN push buttons. When the Fault Log is entered, the readings at the time of the fault are displayed instead of the current readings. The fault number,

[4] SMS letters are not case sensitive.
[5] ###### being the **SITEId.**
[6] Only 5 parameters can be modified in one SMS.
[7] Parameter1, Parameter2 can take any value between A01 and A64 excluding A30. Value1, Value2 can take any value within the parameter's value range.
[8] Only 5 parameters can be viewed in one SMS.

type, KW and KWHr are displayed on the Multifunction display. To scroll between these readings, press the Menu push button. To exit the Fault Log, press the SELECT push button.

7.2 ERASING THE FAULT LOG

To erase the Fault Log, enter the menu, scroll down until "**ERSFLT**" is displayed and press the SELECT push button. The SURF module prompts you to confirm your request by displaying the "**RUSURE**" message. To cancel the request, press the UP push button. To confirm the request, press the DOWN push button.

8 TIME SWITCH OPERATION

The time switch manages the operating time of the genset , daily and weekly. Two parameters control the daily time switch: **T-Rdy** and **T-sdby**. **T-Rdy** sets the time at which the genset becomes ready. **T-sdby** sets the time at which the genset goes to standby mode. If genset is required to be in ready mode all day then set **T-Rdy** to **ALLTIM** (**T-Sdby** will no longer show). **Rdyday** controls the weekly operation. Under **Rdyday**, if **ALL** is set to **Y** then the genset will be ready all week long. Otherwise, the genset will be ready only in days set to **Y**. It will be in standby in days set to **N**. As a result, the genset will be ready during the hours set by **T-Rdy** and **T-Sdby** only on days set to **Y** under **Rdyday**.

8.1 REMOTE CONTROL TERMINAL FUNCTION DESCRIPTION

In SURF-AMF with remote control set to **RQS**: when remote control is active, it overrides time switch setting and forces the genset into ready mode.

In SURF-AMF with remote control set to **SUP**: when remote control is active, it overrides time switch setting and forces the genset into standby mode.

In SURF-AUTO with remote control set to **RQS**: When remote control is active and genset in ready mode, the genset is started. Otherwise, the genset is stopped.

In SURF-AUTO with remote control set to **SUP**: when remote control is active and genset in ready mode, the genset is stopped.

9 FRONT PANEL DESCRIPTION

9.1 MEASURED AND DISPLAYED PARAMETERS

- Voltage, current and frequency measurements correspond to the source feeding the load.
- The currents on the three phases are measured and displayed simultaneously using the following format.

Current range	Format
0 to 99.9A	##.# in A
100 to 999A	### in A
1000 to 1999A	1### in A
2000 to 9999A	#.## in KA

- The line-neutral and line-line voltages are all measured. The voltage displayed is either fixed on one voltage or allowed to scroll automatically between all six voltages (rn, sn, tn, rs, st, tr). The Menu push button is used to switch between the two display modes.
- The frequency is measured and permanently displayed.
- The hour meter is measured (or taken from the CAN bus if it is enabled) and permanently displayed.
- The engine temperature and oil pressure are measured (or taken from the CAN bus if it is enabled) and permanently displayed
- The battery voltage is measured and permanently displayed
- The Multifunction portion of the LCD displays the number of hours since the last oil change, the active power in KW for the source feeding the load, the energy in KWh for the genset, Utility and Genset status and the CAN readings: RPM, L/H, L, Add and DTC error messages. To start or stop scrolling between these messages, press the push button of the current operating mode.

9.2 FRONT PANEL LEDS

- Four Leds are used to indicate the operating mode.
- Six input Leds used to indicate the status of the inputs.
- Utility supply has one red led. Led ON indicates that the Utility supply is within the acceptable limits, the phases are all present and in the right sequence. Led OFF indicates absence of Utility. Led blinking indicates an anomaly on the Utility.
- Utility contactor has one green led to show its status.

- Genset has one red led. Led OFF means that the genset is not requested to start. Led blinking means that the genset has been requested to start or the genset is running with an anomaly. Led ON indicates that genset is running and ready to supply the load.
- Genset contactor has one green led to show its status.

9.3 DETECTED AND SIGNALED FAULTS AND WARNINGS

9.3.1 WARNINGS

High Engine Temperature Warning occurs when the analog engine temperature sensor reading goes above the High Engine Temperature Pre-alarm value set by **HTP** in the menu or when the engine temperature switch is active and the 4 second fault delay is still being counted. The Engine Temperature symbol blinks indicating this warning.

Low Coolant Level Warning occurs when the coolant switch is detected active and the 4 second delay is being counted. The Coolant Level symbol ( ) on the LCD blinks to indicate this warning.

Low Oil Pressure Warning occurs when the analog reading goes below the Low Oil Pressure Pre-alarm value set by **LoP** in the menu or when the oil pressure switch is detected and the fault delay (2 sec) is being counted. The Oil Pressure symbol blinks indicating this warning.

Low Fuel Level Warning occurs when the fuel switch is detected active and the 4 second delay is being counted. The Fuel Level symbol ( ) on the LCD blinks to indicate this warning.

Low Dynamo Voltage Warning occurs when the dynamo voltage decreases below the dynamo shutdown voltage set by **dSd** and the 5 second delay is being counted. The Dynamo Voltage ( ) symbol on the LCD blinks to indicate this warning.

Over/Under Frequency Warning occurs when the frequency goes above/below the values set in **GoF/GuF** (for Genset), **UoF/UuF** (for Utility) and the delay set by **GoFd/GuFd** (for Genset)**, UoFd/UuFd** (for Utility) is being counted. For the genset, the RPM symbol ( ) turns on to indicate this warning.

Oil Change Warning occurs when the hours since last oil change exceed the value set by **RHR**. This warning is indicated by the blinking of the Oil Pressure symbol on the LCD. To reset the oil change counter, press the push button corresponding to the current operating mode for 2 seconds.

9.3.2 FAULTS

To delete the current fault, press and release the Off push button.

Fault	Comments	Symbol
Fail to start	Genset fails to start after the maximum number of attempts was reached	!
Emergency stop	Shuts load, engine and all outputs immediately	!
High Battery	Shuts load and engine after the elapse of the High Battery delay (Hbd)	!
Low Battery	Shuts load and engine after the elapse of the Low Battery delay (Lbd)	!
High Engine Temp.	Shuts load and engine due to high engine temperature	
High Oil Temp.	Shuts load and engine due to high oil temperature	!
Low Coolant Level	Shuts load and engine due low coolant level	
Low Oil Pressure	Shuts load and engine due to low oil pressure	
Low Fuel Level	Shuts load and engine due to low fuel level	
Low Dynamo Volt	Shuts load and engine due to low dynamo voltage	
Genset Over Voltage	Shuts the load and engine after the elapse of the over voltage delay (GoVd)	!
Genset Under Voltage	Shuts the load and engine after the elapse of the under voltage delay (GuVd)	!
Genset Phase Failure	Shuts load and engine due to a phase failure	!
Genset Sequence Failure	Shuts engine due to a sequence failure	!
Genset Over Frequency	Shuts the load and engine after the elapse of the over frequency delay (GoFd)	
Genset Under Frequency	Shuts the load and engine after the elapse of the over frequency delay (GuFd)	
Over Load	Shuts the load and engine after the elapse of the over load delay (oLdd)	--
Utility Over Voltage	Shuts the load after the elapse of the over voltage delay (UoVd)	--
Utility Under Voltage	Shuts the load after the elapse of the under voltage delay (UuVd)	--
Utility Phase Failure	Shuts load due to a phase failure	--
Utility Sequence Failure	Utility anomaly due to sequence failure	--
Utility Over Frequency	Shuts the load after the elapse of the over frequency delay (UoFd)	--
Utility Under Frequency	Shuts the load after the elapse of the over frequency delay (UuFd)	--

Fail to Start Fault occurs when the engine does not turn on after **ATT** cranking attempts. **ATT** is set in the menu. The fault is removed when the Remote Control input is recycled or when Utility is restored. The fault symbol (**!**) blinks and the Multifunction display indicates a start fail fault by displaying **St Fail** in the Genset Status page.

Emergency Stop occurs when the emergency switch is turned off. All the outputs from the SURF will be disabled, the fault symbol (**!**) turns on and the Multifunction display indicates the fault by displaying **E-StoP** in the Genset Status page.

High Battery Fault occurs when the battery voltage exceeds **Hib** for a delay set by **Hbd.** The fault symbol (**!**) turns on and the Multifunction display indicates a high battery fault by displaying **bat-Hi** in the Genset Status page.

Low Battery Fault occurs when the battery voltage drops below **Lob** for a delay set by **Lbd**. This fault is tested when the engine is not cranking and independent of the fault bypass delay. The fault symbol (**!**) turns on and the Multifunction display indicates a low battery fault by displaying **bat-Lo** in the Genset Status page.

High Engine Temperature Fault occurs when the engine temperature switch is detected on for 4 seconds or when the analog engine temperature sensor reading goes above the High Engine Temperature Alarm value set by **HTA** in the menu. The Engine Temperature symbol ( ) turns on and the Multifunction display shows **Fault** in the Genset Status page. Genset goes into cooling if **CHT** is set to **Y**.

High Oil Temperature Fault occurs when the oil temperature switch is detected on for 4 seconds. The fault symbol (**!**) turns on and the Multifunction display indicates a high oil temperature fault by displaying **Hi-Oil T** in the Genset Status page.

Low Coolant Level Fault occurs when the coolant switch is detected active for 4 seconds. The Coolant Level symbol ( ) on the LCD turns on and the Multifunction display shows **Fault** in the Genset Status page.

Low Oil Pressure Fault occurs when the oil pressure switch is detected on for 2 seconds or when the analog oil pressure sensor reading goes below the Low Oil Pressure Alarm value set by **LoA** in the menu. The Oil Pressure symbol () turns on and the Multifunction display shows **Fault** in the Genset Status page.

Low Fuel Level Fault occurs when the fuel switch is detected active for 4 seconds. The Fuel Level symbol ( ) on the LCD would turn on and the Multifunction display shows **Fault** in the Genset Status page.

Low Dynamo Voltage Fault occurs when the dynamo voltage decreases below the dynamo shutdown voltage set by **dSd** for 5 seconds. The Dynamo Voltage ( ) symbol on the LCD turns on and the Multifunction display shows **Fault** in the Genset Status page.

Over/under Voltage Fault occurs when one of the three-phase voltages goes above/below the over/under voltage limits set by **GoV/GuV** (for Genset), **UoV/UuV** (for Utility) for a delay of **GoVd/GuVd**(for Genset)**, UoVd/UuVd** (for Utility). The Multifunction display indicates an over/under voltage fault by displaying **oVolt/uVolt** in the Genset Status page or **U-VX** in the Utility Status page. If the fault occurs on the genset, the fault symbol (**!**) turns on.

Phase Failure Fault occurs when the voltage on one of the lines falls below 100V or the voltage difference between any two phases exceeds 120V or the frequency goes below 15Hz. The Multifunction display indicates the fault by displaying **Ph Fail** in the Genset Status page or **U- VX** in the Utility Status page. If the fault occurs on the genset, the fault symbol (**!**) turns on.

Sequence Failure Fault occurs when the phases are reversed. The Multifunction display indicates the fault by displaying **SQ Fail** in the Genset Status page or **U- SX** in the Utility Status page. If the fault occurs on the genset, the fault symbol (**!**) turns on.

Over/Under Frequency Fault occurs when the frequency goes above/below the values set in **GoF/GuF** (for Genset), **UoF/UuF** (for Utility) for a delay of **GoFd/GuFd** (for Genset)**, UoFd/UuFd** (for Utility). The Multifunction display indicates an over/under frequency fault by displaying **oFREQ/uFREQ** in the Genset Status page or **U-FX** in the Utility Status page. For the genset, the RPM symbol ( ) turns on for an under frequency fault and blink for an over frequency fault.

Overload Fault occurs when the load on the genset exceeds the value set by **oLd** for a delay set by **oLdd**. The fault symbol (**!**) turns on and the Multifunction display indicates an overload fault by displaying **oVLoad** in the Genset Status page. Genset goes into cooling if **CHT** is set to **Y**.

9.4 DESCRIPTION OF STATUS MESSAGES SHOWN ON MULTIFUNCTION DISPLAY

9.4.1 FOR UTILITY [9]

Status Message	Description
U-AbSt	Utility is Absent
U-RdY	Utility is Ready
U- VX	Utility Voltage error (Over/under voltage, phase failure)
U- FX	Utility Frequency error (Over/under frequency)
U- SX	Utility Sequence error
U-W 10	Utility is being restored with count down
U-X 10	Utility is counting Transfer Dead Time with count down
U-OnLd	Utility is Feeding Load

9.4.2 FOR GENSET

Status Message	Description
StndbY	Genset ready but Remote Control is absent
REAdY	Genset ready
NotRdY	Genset not ready
RSP 10	Engine Counting Response delay with count down
PHT 10 [10]	Engine Preheating with count down
CRANKG	Engine Cranking
RUNING	Engine running
WUP 10	Engine Warming Up with count down
XFR 10	Engine counting Transfer Dead Time with count down
OnLoad	Engine running on load
SLd 10	Engine Shutting Load with count down
CoL 10	Engine Cooling with count down
SEG 10 [11]	Shutting Engine with count down
Fault	A fault has occurred on the Genset
Hi-Oil T	High oil temperature Fault
E-StoP	Emergency stop
St Fail	Fail to start Fault
Ph Fail	Genset Phase failure Fault
SQ Fail	Genset Sequence failure Fault
bat-Hi	High battery Fault
bat-Lo	Low battery Fault
oFREQ	Genset Over frequency Fault
uFREQ	Genset Under frequency Fault
oVolt	Genset Over voltage Fault
uVolt	Genset Under voltage Fault
oVLoad	Overload Fault
-----L	Fuel Level (Available only when CAN is enabled)
----rPM	Rounds per minute (Available only when CAN is enabled)
---L/H	Fuel Consumption Rate (Available only when CAN is enabled)
---Add	CAN Address (Available only when CAN is enabled)

[9] Available only for Surf-AMF
[10] Available only if one of the outputs is set to Preheat
[11] Available only if one of the outputs is set to Cut-Off

10 REAR PANEL DESCRIPTION

10.1 TERMINAL DESCRIPTION

TERMINAL	CONNECTOR P1			CONNECTOR P2		
	1	-VBAT SUP	-ve battery supply	7	OUTPUT 4	Output 4 (Genset Contactor)
	2	+VBAT SUP	+ve battery supply	8	OUTPUT 5	Output 5 (Alarm Output)
	3	VBAT POW	After emergency stop and fuse	9	OUTPUT 6	Output 6 (Genset Contactor 2)
	4	OUTPUT 1	Output 1 (Starter)	10	DYN EXC	Dynamo excitation
	5	OUTPUT 2	Output 2 (Fuel Electric Valve)	11	CAN H	CAN High line
	6	OUTPUT 3	Output 3 (Utility Contactor)	12	CAN L	CAN Low Line

TERMINAL	CONNECTOR P3			CONNECTOR P4		
	13	REF SENS	Reference sensor input	19	RMTE CNTRL	Remote control input
	14	AN INPUT 1	Analog Input 1 (Oil pressure sensor input)	20	INPUT 1	Input 1 (Oil pressure switch)
	15	AN INPUT 2	Analog Input 2 (Engine temperature sensor input)	21	INPUT 2	Input 2 (Engine temperature switch)
	16	AN INPUT 3	Analog Input 3 (Not Assigned)	22	INPUT 3	Input 3 (Oil temperature switch)
	17	AN INPUT 4	Analog Input 4 (Not Assigned)	23	INPUT 4	Input 4 (Low Fuel level Normally Open)
	18	LCL	Low Coolant Probe	24	INPUT 5	Input 5 (Lamp Test)

TERMINAL	CONNECTOR P5			CONNECTOR P6		
	25	LINE RU	Line R – U supply	31	LINE RG	Line R – G supply
	26	NOT USE	Not used	32	NOT USE	Not used
	27	LINE SU	Line S – U supply	33	LINE SG	Line S – G supply
	28	NOT USED	Not used	34	NOT USED	Not used
	29	LINE TU	Line T – U supply	35	LINE TG	Line T – G supply
	30	N U	Neutral – U supply	36	N G	Neutral – G supply

TERMINAL	CONNECTOR P7		
	37	CT R P1	Current transformer on line R – p1
	38	CT R P2	Current transformer on line R – p2
	39	CT S P1	Current transformer on line S – p1
	40	CT S P2	Current transformer on line S – p2
	41	CT T P1	Current transformer on line T – p1
	42	CT T P2	Current transformer on line T – p2

10.2 LEDS DESCRIPTION

Led No.	Color	Input configuration	Correspondent factory configuration
1	Green	Remote Control signal	Remote Control signal
2	Red	IP1 signal	Oil pressure signal
3	Red	IP2 signal	Engine temperature signal
4	Red	IP3 signal	Oil temperature signal
5	Red	IP4 signal	Low Fuel level Normally Open signal
6	Red	IP5 signal	Lamp Test signal

11 MENU DESCRIPTION

Follow the steps described below to access the menu:

1. Press the Menu Push button for three seconds: The alphanumeric characters on the LCD would display "PSW – ". You will be prompted to enter a three-digit code. The default password is 000.
2. Use the UP and DOWN push buttons to scroll to the desired number.
3. Press the SELECT push button. "*" replaces the first digit.
4. Repeat steps 2. and 3. until all three digits are entered.

If the entered password is valid, the user will have access to the menu below. If no push buttons are pressed for 5 minutes while in the menu, the system will automatically exit the menu.

The SMS Alias column in the table represents the SMS code to use when modifying the parameter through SMS. In the Range column below, the number between brackets is the one to use when the parameter is being modified through SMS.

SMS Alias	Display	Parameter Description	Range	Factory setting
A01	RSP	Response delay	0 to 255 sec	5 sec
A02	PRH	Preheat delay	0 to 255 sec	0 sec
A03	STA	Starter time	0 to 255 sec	5 sec
A04	bET	Time between trials	0 to 255 sec	12 sec
A05	ATT	Number of Attempts	0 to 255	3 Att
A06	bYP	Fault bypass delay	0 to 255 sec	15 sec
A07	WuP	Warm-up delay	0 to 255 sec	10 sec
A08	MRT oFF	Mains Restoration delay (AMF only) Off delay (AUTO only)	0 to 255 sec	10 sec
A09	XFR	Transfer dead time (AMF only)	0 to 255 sec	0 sec
A10	CoL	Cooling delay	0 to 255 sec	30 sec
A11	Cut	Cut-Off time	N *(0)*, 1 to 255 sec	10 sec
A12	CrF	Crank Disconnect Freq.	0 to 255 Hz	15 Hz
A13	UoF	Utility Over Frequency (AMF only)	N *(0)*, 1 to 255 Hz	55 Hz
A14	UoFd	Utility Over Freq. delay (AMF only)	0 to 99 sec	2 sec
A15	UuF	Utility Under Frequency (AMF only)	N *(0)*, 1 to 255 Hz	45 Hz
A16	UuFd	Utility Under Freq. delay (AMF only)	0 to 99 sec	5 sec
A17	UoV	Utility Over Voltage (AMF only)	N *(0)*, 1 to 255 V	240 V
A18	UoVd	Utility Over Volt. delay (AMF only)	0 to 99 sec	3 sec
A19	UuV	Utility Under Voltage (AMF only)	N *(0)*, 1 to 255 V	200 V
A20	UuVd	Utility Under Volt. delay (AMF only)	0 to 99 sec	5 sec
A21	GoF	Genset Over Frequency	N *(0)*, 1 to 255 Hz	55 Hz
A22	GoFd	Genset Over Freq. delay	0 to 99 sec	2 sec
A23	GuF	Genset Under Freq.	N *(0)*, 1 to 255 Hz	45 Hz
A24	GuFd	Genset Under Freq. delay	0 to 99 sec	5 sec
A25	GoV	Genset Over Voltage	N *(0)*, 1 to 255 V	240 V
A26	GoVd	Genset Over Volt. delay	0 to 99 sec	3 sec
A27	GuV	Genset Under Voltage	N *(0)*, 1 to 255 V	200 V
A28	GuVd	Genset Under Volt. delay	0 to 99 sec	5 sec
A29	CT	Current Transformer ratio	0/5 to 9999/5	100/5
A31	oLd	Overload %	N *(0)*, 1 to 255%	90%
A32	oLdd	Overload delay	0 to 99 sec	10 sec
A33	doN	Dummy load engage set point	N *(0)*, 1 to 255 %	10%
A34	dod	Dummy load engage delay	0 to 255 sec	30
A35	doF	Dummy load disengage set point	N *(0)*, 1 to 255 %	17%
A36	boP	Bypass OPS	Y *(0)*,1 to 5 sec	1 sec

SMS Alias	Display	Parameter Description	Range	Factory setting
A37	oPS	Oil Pressure Sensor type	V1=VDO type 1 *(0)* V5=VDO type 2 *(1)* MU=Murphy *(2)*	V1
A38	LoP	Low Oil Pressure Pre-alarm	N *(0)*, 1 to 255 PSI	N
A39	LoA	Low Oil Pressure Alarm	N *(0)*, 1 to 255 PSI	N
A40	ETS	Engine Temperature Sensor type	V1=VD0-1 *(0)* V2=VD0-2 *(1)* MU=Murphy *(2)* *PT=PT100 (3)*	V1
A41	HTP	High Engine Temp Pre-alarm	N *(0)*, 1 to 255 ^{o}C	N
A42	HTA	High Engine Temp Alarm	N *(0)*, 1 to 255 ^{o}C	N
A43	CHT	Cooling After High Temperature	N *(0)*,Y *(1)*	Y
A44	dcd	Dynamo Crank Disconnect	N *(0)*, 10 to 26 V	10 V
A45	dSd	Dynamo Shut Down	N *(0)*, 5 to 10 V	10 V
A46	Hib	High Battery	N *(0)*, 1 to 255 V	30 V
A47	Hbd	High Battery Delay	0 to 255 sec	3 sec
A48	Lob	Low Battery	N *(0)*, 1 to 255 V	8 V
A49	Lbd	Low Battery Delay	0 to 255 sec	2 sec
A50	LcL	Low Coolant Level	Nc *(0)*, No *(1)*	No
A51	O1	Output 1	N/A=Not Assigned *(0)* PRE=Preheat *(1)* STA=Starter *(2)* EVA= Evalve *(3)* C-U=Cont-Utility *(4)* C-G=Cont-genset *(5)* ALA=Alarm *(6)* Cut=Cut Off *(7)* PRA=PreAlarm *(8)* CG2=Cont-Gstep2 *(9)* dLd=Dummy Ld *(10)* oLd=Overload *(11)* STF=StartFail *(12)* AUT=Auto Mode *(13)*	STA
A52	O2	Output 2	(same as above)	EVA
A53	O3	Output 3	(same as above)	C-U
A54	O4	Output 4	(same as above)	C-G
A55	O5	Output 5	(same as above)	ALA
A56	O6	Output 6	(same as above)	CG2
A57	RC	Remote Control	RoS= Request Genset On Signal *(0)* SUP= Simulate Utility Present *(1)*	GRd
A58	I1	Input 1	N/A=Not Assigned *(0)* oPS=Oil Pressure *(1)* ETS=Engine Temp. *(2)* oTS=Oil Temp. *(3)* LFo=Low Fuel No *(4)* LFc=Low Fuel Nc *(5)* LMP=Lamp Test *(6)*	oPS
A59	I2	Input 2	(same as above)	ETS
A60	I3	Input 3	(same as above)	oTS
A61	I4	Input 4	(same as above)	LFo
A62	I5	Input 5	(same as above)	LMP
A63	RHR	Run Hour	N *(0)*, 1 to 255 hr.	150 hr.
A64	ECU[12]	Engine Electronic Control Unit Type (cannot be modified when engine is running)	No=No control unit *(0)* SE=Standard engine *(1)* VE=Volvo Engine *(2)* PE=Perkins Engine *(3)*	No
A65	APP	Accelerator Pedal Position[13]	0 to 100 %	50%
A66	IDL	Idle Speed Delay[13]	N *(0)*,1-99	N

[12] To enable ECU, **boP** parameter must be set to **Y** (ECU cannot be modified when SURF is showing "**NotRdy**")
[13] These parameters are only available when ECU type is Volvo and cannot be modified when engine is running

SMS Alias	Display	Parameter Description	Range	Factory setting
A67	SPD	Speed Select[13]	PRI=Primary speed *(0)* SEC=Secondary speed *(1)*	PRI
A68	UPW	User Password	000 to 999	000
A69	Mod	Modem Type	No=no modem *(0)* LM=Line modem *(1)* GSM=GSM modem *(2)*	No
A70	PHONE	Phone Number	(3 to 18 digits)	0
A71	SITEId	Identification Code	(6 digits or letters)	SURF00
A72	dHC	DHCP Enabled	N *(0)*,Y *(1)*	N
A73	IP Adr	IP Address	---.---.---.---	192.168.0.21
A74	SubNET	Subnet Mask	---.---.---.---	255.255.255.0
A75	GATEWY	Default Gateway	---.---.---.---	192.168.0.1
A76	UPH	Utility Connection (AMF & AMF/ES only)	3PH=3 phase *(0)* 1PH=1 phase *(1)*	3PH
A77	GPH	Genset Connection	3PH=3 phase *(0)* 1PH=1 phase *(1)*	3PH
A78	dATE	Set the date	DD.MM.YY	-
A79	TIME	Set the time	##h##P or ##h##A	-
A80	T--RdY	Set the genset ready time	ALLTIM, ##h##P or ##h##A	-
A81	T--SdbY[14]	Set the genset standby time	##h##P or ##h##A	-
A82	RdYdAY	Set the genset ready days		-
A83	ALL		N *(0)*,Y *(1)*	N
A84	SUN[15]		N *(0)*,Y *(1)*	Y
A85	MON[15]		N *(0)*,Y *(1)*	Y
A86	TUE[15]		N *(0)*,Y *(1)*	Y
A87	WED[15]		N *(0)*,Y *(1)*	Y
A88	THU[15]		N *(0)*,Y *(1)*	Y
A89	FRI[15]		N *(0)*,Y *(1)*	Y
A90	SAT[15]		N *(0)*,Y *(1)*	Y
A91	WEX[16]	Weekly exercise	N *(0)*,Y *(1)*	N
A92	S--NAME	Server name		www.sascontrollers.com
A93	S--IP	Server IP Address	---.---.---.---	69.167.158.129
A94	HR.	Modify Hour meter (only if ECU=No)	0 to 65530	000000
A95	KWh	Modify KWhour	0 to 999999	000000
-	ERSFLT	Erase Fault Log	---	---
-	VIEWFT	View Fault Log	---	---
-	EXIT	Exit Menu	---	---

12 TECHNICAL SPECIFICATION

Supply voltage range	5 to 33Vdc
Maximum supply current	180mA
Standby supply current	56mA
Digital inputs activation logic	Low (ground)
Solid-State Output rating	1A 50V
AC inputs range (L-N)	0 to 256Vac
CT inputs range	0 to 5A
Operating temperature	-30 to 70°C
User access	Five push buttons
Data sampling rate	0.4samples/sec
Dimensions	196x144x33
Panel cut out	182x137

[14] Appears only if T—Rdy is set to time
[15] Appears only if ALL is set to N
[16] When enabled, if generator did not operate between Sunday and Friday, it would be started on Saturday at 8:00 am for half an hour

13 FIRMWARE UPGRADE

13.1 INSTALLING THE SURF FIRMWARE UPGRADE SOFTWARE

In order to upgrade firmware on site, a CD will be provided by S.&A.S.Ltd & the below steps shall be followed:

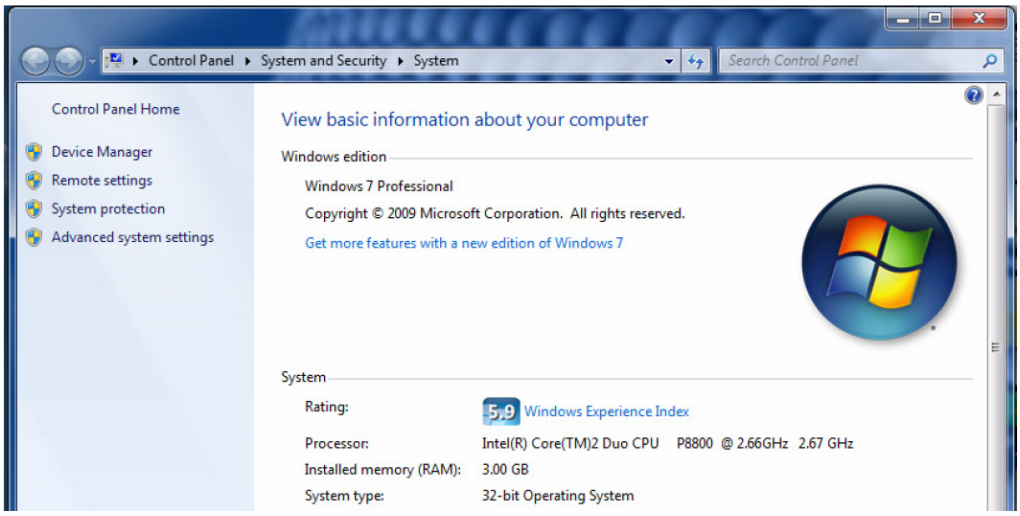
1. Run file “SAS_Patch.exe” located in “Surf120_PTool\SAS_PTool” folder.
2. Setup the application located in “Surf120_PTool\SAS_PTool \SAS_PTool_Setup” folder
3. SAS_PTool will appear in the programs list. Send it to Desktop as shortcut.

13.2 INSTALLING THE SURF USB DRIVER

1. Plug in the USB cable to the SURF device before turning power on
2. Turn on power of the SURF device. All the leds on the front starts blinking.

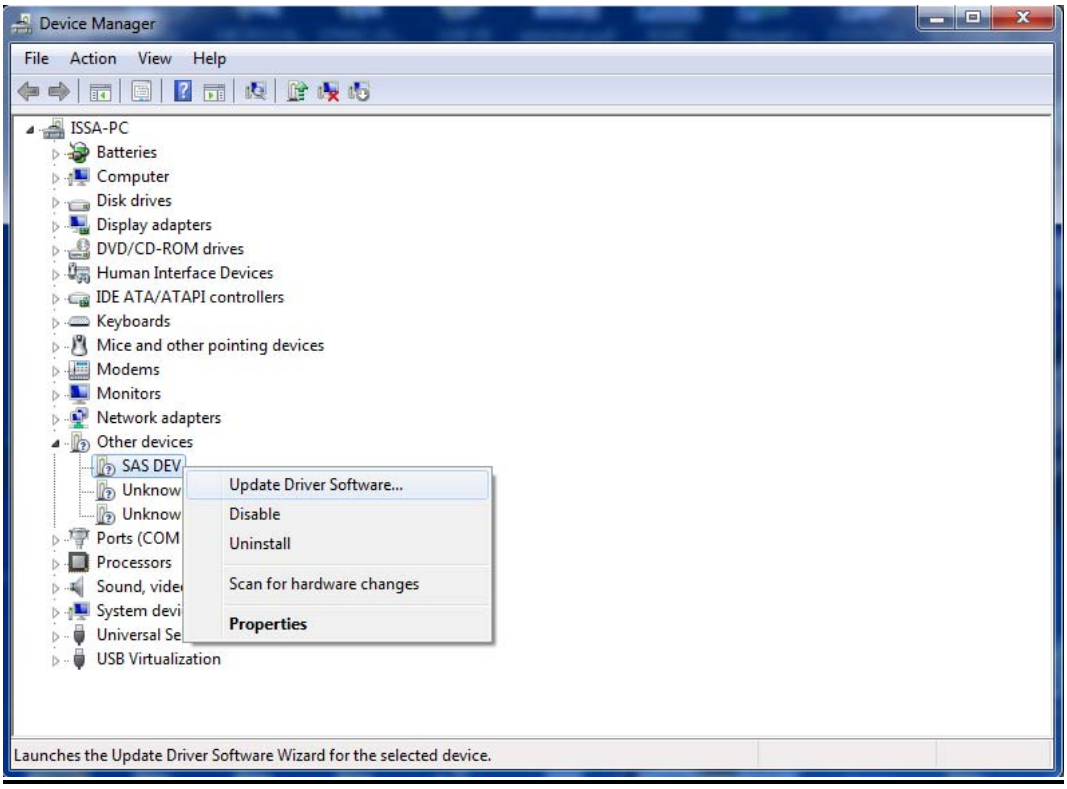
13.2.1 DRIVER SETUP FOR WINDOWS VISTA/WIN7[17]

The first SURF plugged into the PC USB port may not launch an automatic start. In this case, right-click my computer and choose properties. The following window appears. On the left side of the window, click on Device Manager.

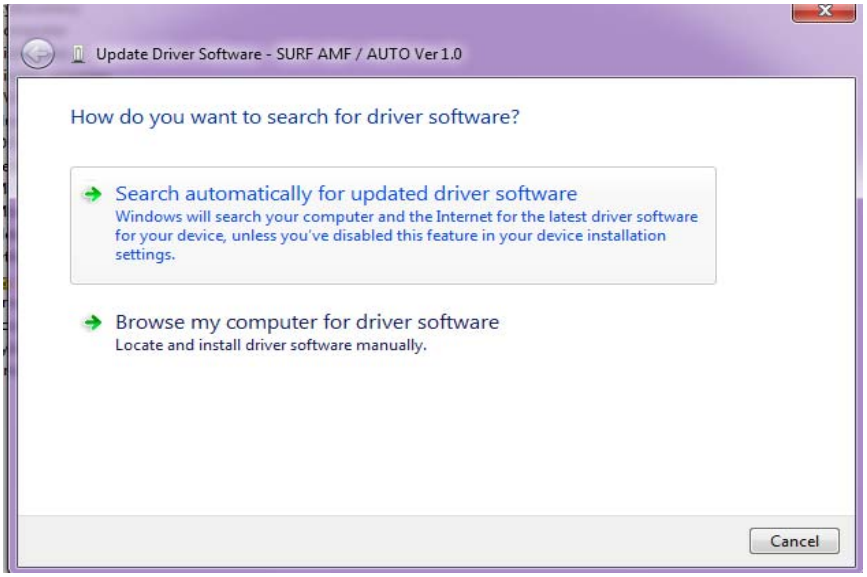


[17] This will be implemented only one time when the first Surf is connected to PC through USB.

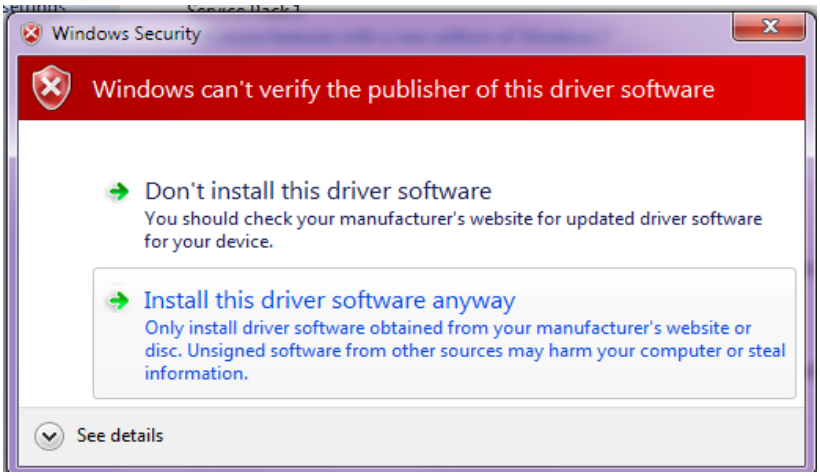
The “SAS DEV” device will appear in Other Devices, right-click it and choose Update Driver Software.



Select “Search automatically for updates driver software”.


Update Driver Software - SURF AMF / AUTO Ver1.0
How do you want to search for driver software?
Search automatically for updated driver software
Windows will search your computer and the Internet for the latest driver software for your device, unless you've disabled this feature in your device installation settings.
Browse my computer for driver software
Locate and install driver software manually.
Cancel

Select Install this driver software anyway.


Windows Security
Windows can't verify the publisher of this driver software
Don't install this driver software
You should check your manufacturer's website for updated driver software for your device.
Install this driver software anyway
Only install driver software obtained from your manufacturer's website or disc. Unsigned software from other sources may harm your computer or steal information.
See details

The Driver SETUP procedure will be done only once For Windows vista/Win7.

So, the driver of any new SURF connected to the PC USB port will be installed automatically.

13.2.2 DRIVER SETUP FOR WINDOWS XP

Each time new SURF is plugged into the PC USB port, a “Found New Hardware Wizard” window appears.

Select “Install the software automatically (Recommended)” and click next.

Found New Hardware Wizard
Welcome to the Found New Hardware Wizard
This wizard helps you install software for:
Communications Port MS
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel

Select “Continue Anyway”.

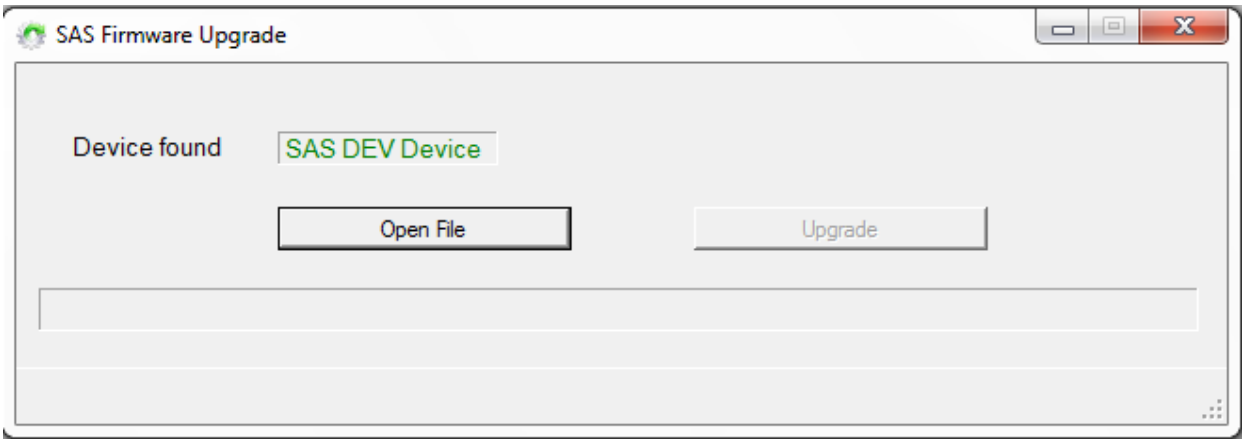
Hardware Installation
The software you are installing for this hardware:
Communications Port MS
has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)
Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.
Continue Anyway
STOP Installation

The driver of the new SURF connected to the PC USB port will be installed automatically.

13.3 FIRMWARE UPGRADE PROCESS

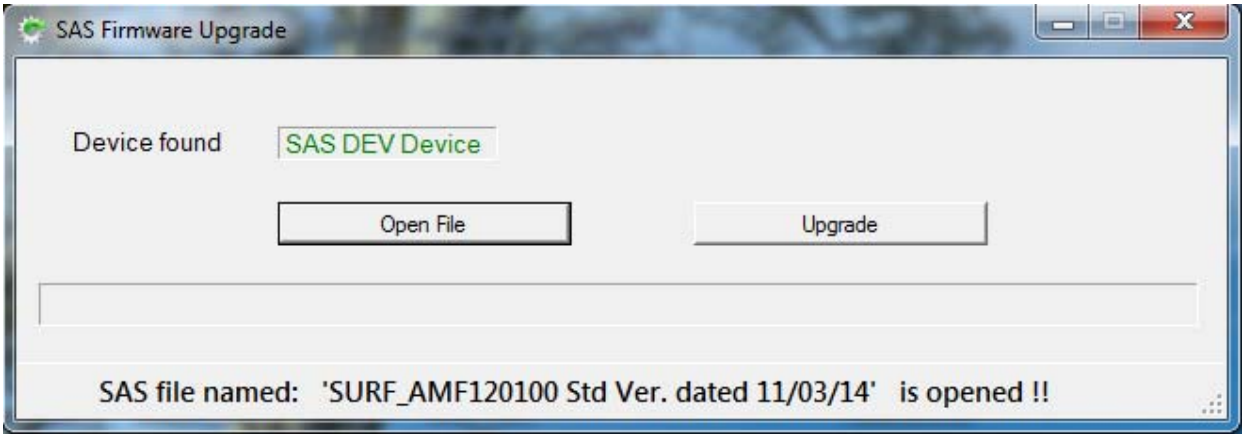
Run “SAS_PTool” application.

The following window will appear prompting the user that the SURF board is detected on the USB port:

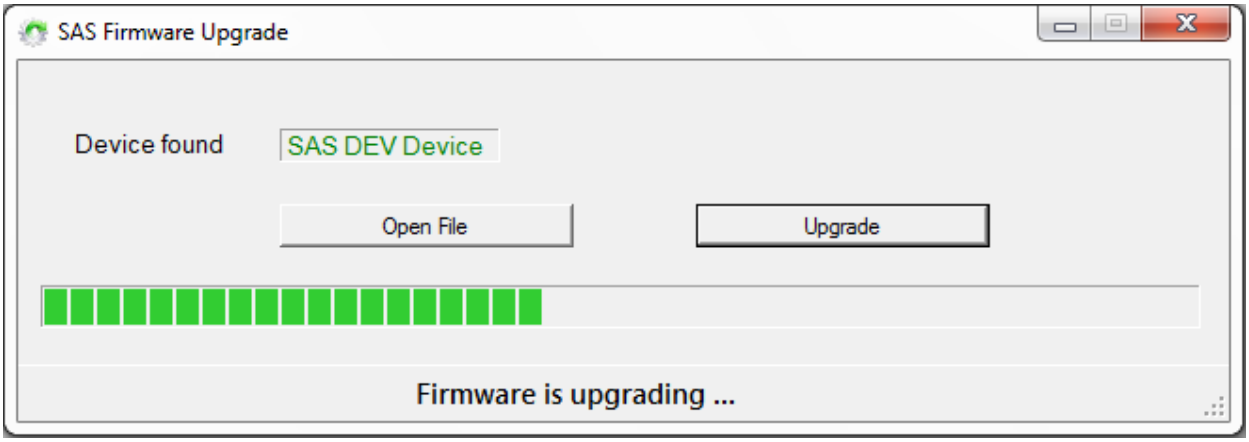


Click Open to choose the *.sas file that will be used to upgrade the firmware.

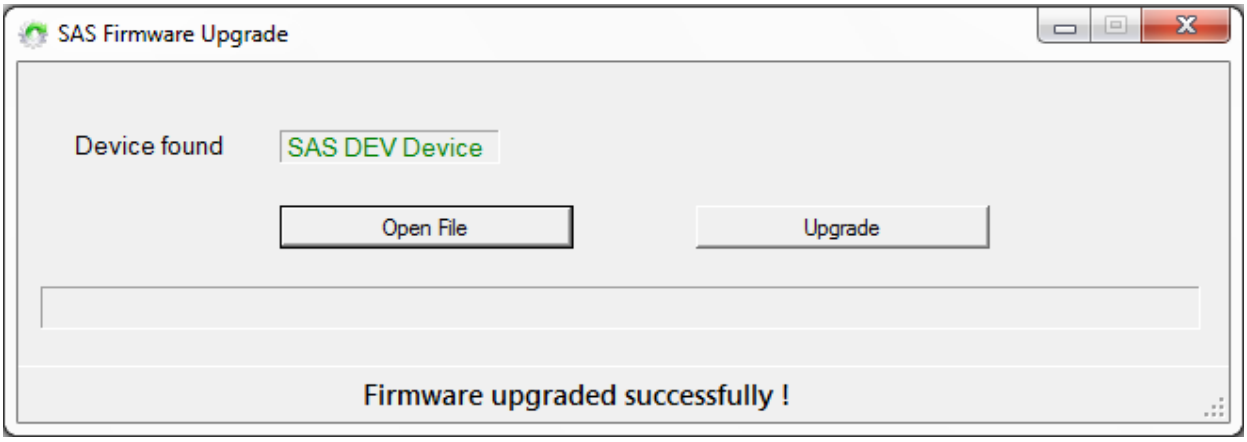
A Footnote will appear showing the file name, the software version and its date:



Click upgrade. The upgrade progress is shown as below:

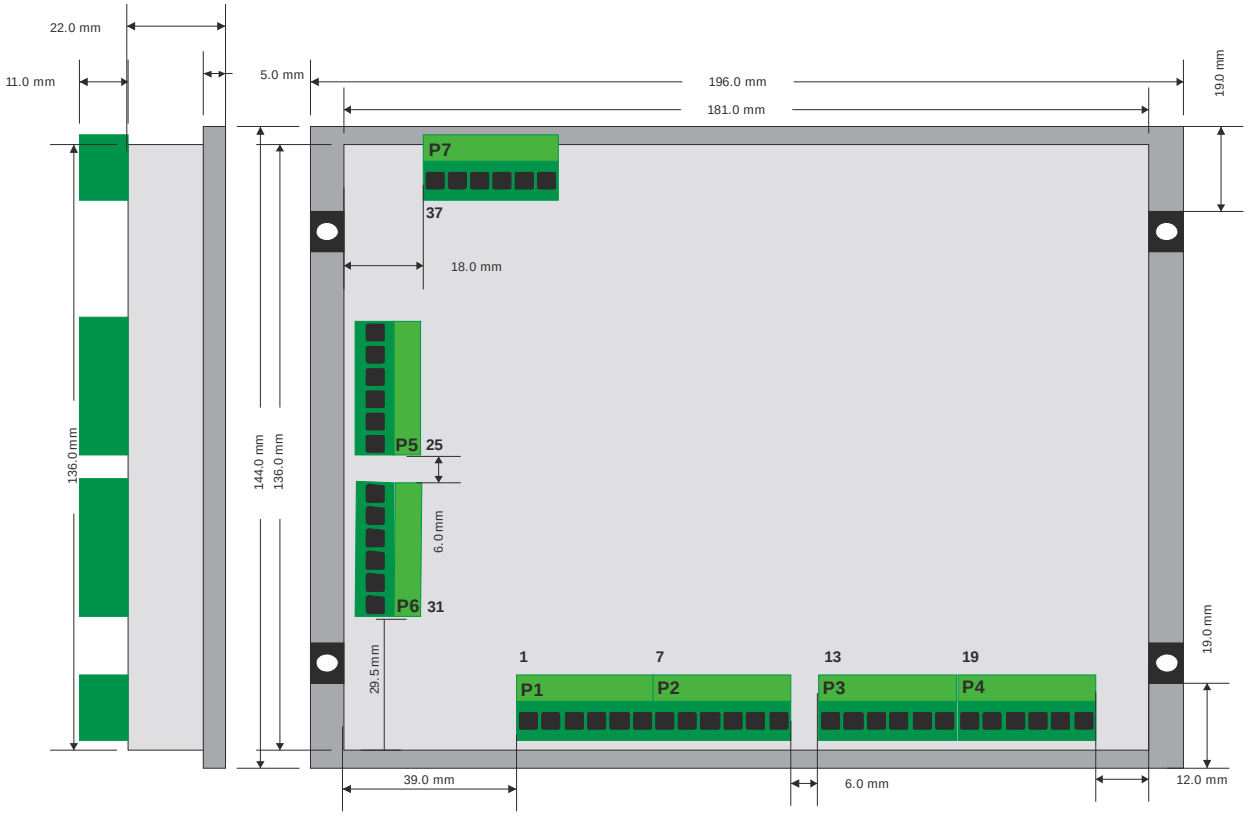


Once the upgrade is complete, the footnote “Firmware upgraded successfully” will appear:



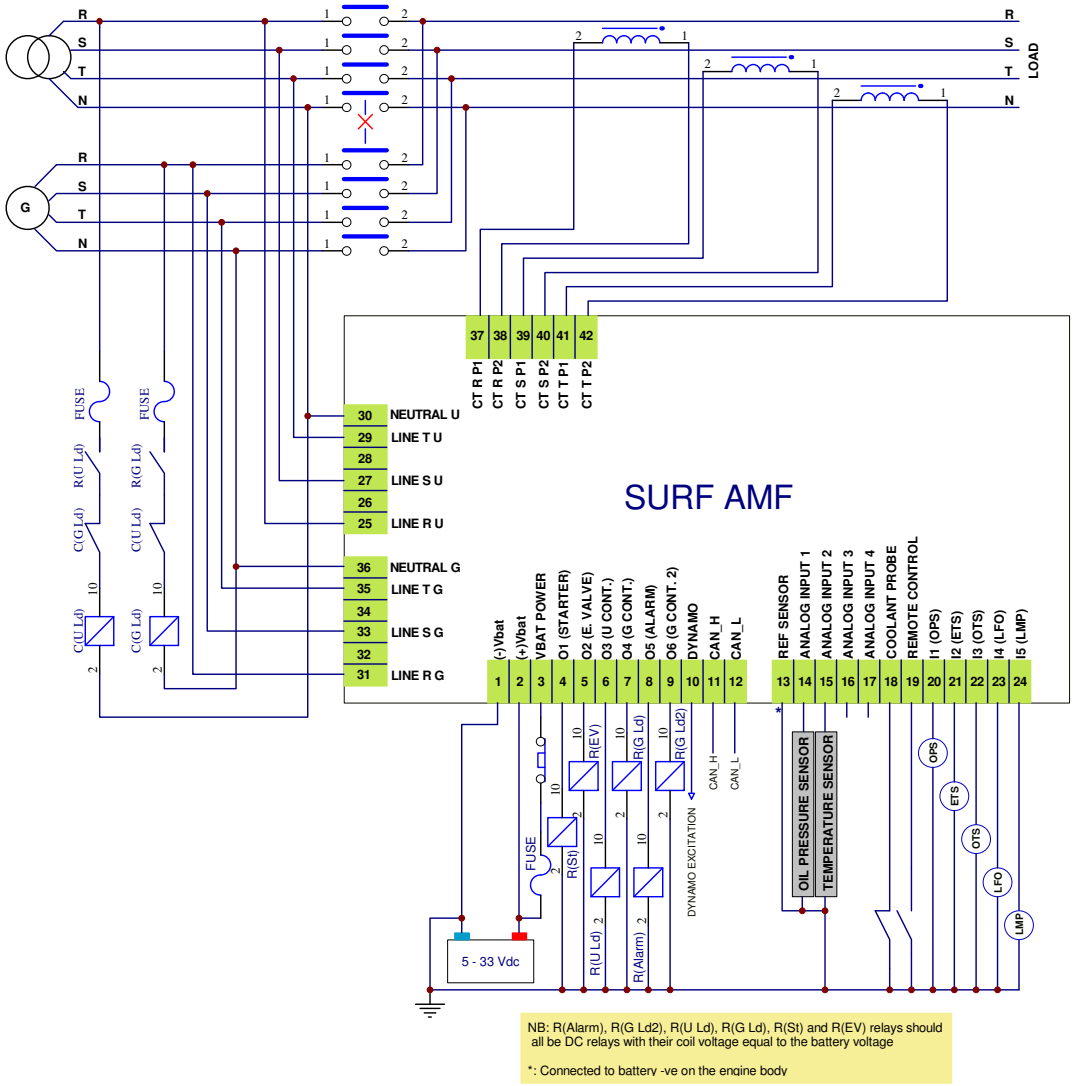
Then the SURF Firmware upgraded successfully and the SURF will automatically run the new firmware.

14 CASE DIMENSIONS



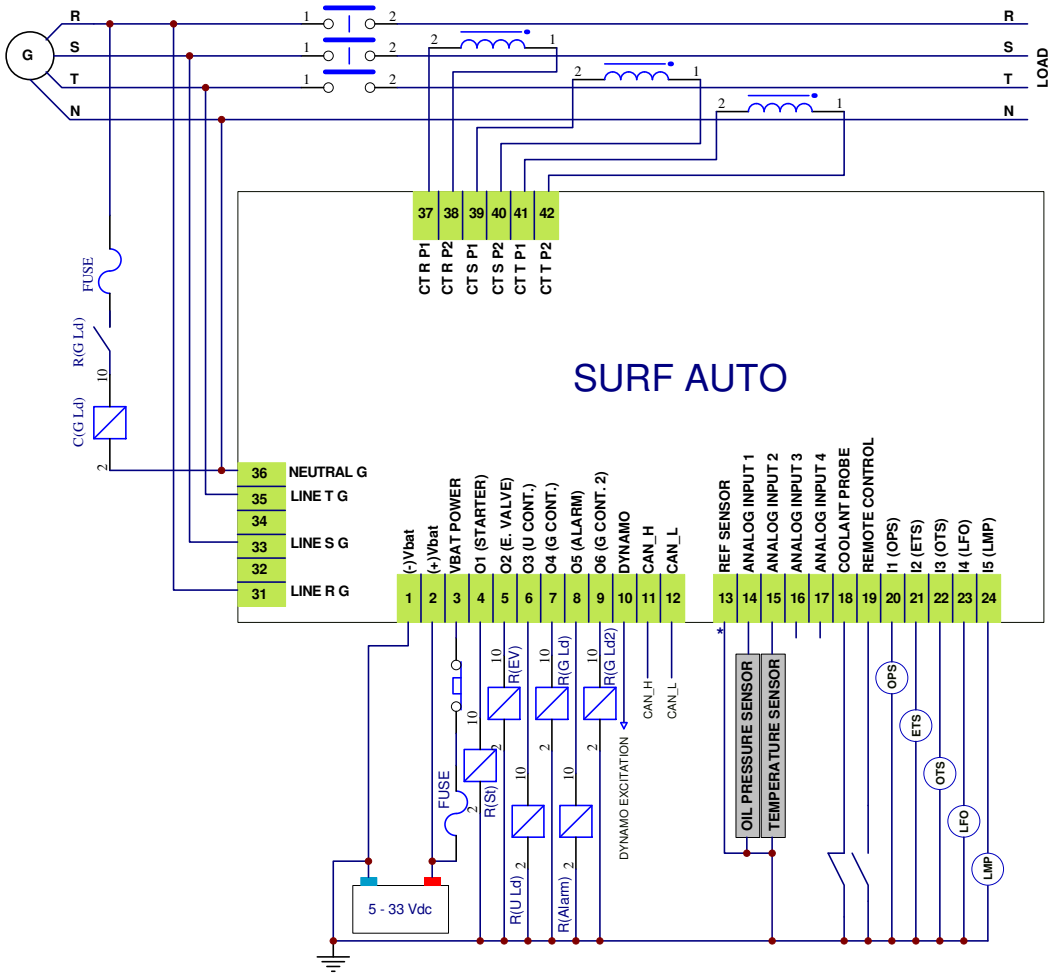
15 WIRING DIAGRAM

This section contains the wiring diagram of the SURF-AMF and SURF-AUTO.



NB: R(Alarm), R(G Ld2), R(U Ld), R(G Ld), R(St) and R(EV) relays should all be DC relays with their coil voltage equal to the battery voltage

*: Connected to battery -ve on the engine body



NB: R(Alarm), R(G Ld2), R(U Ld), R(G Ld), R(St) and R(EV) relays should all be DC relays with their coil voltage equal to the battery voltage

*: Connected to battery -ve on the engine body